

1. A system for rapidly generating multiple alternative pilot training and transition plans which include a recall of furloughed pilots for an entire airline, which comprises:

5 a user interface receiving input data and user requests including a request to recall said furloughed pilots;

a database having stored therein said input data and a current pilot training and transition plan; and

10 an optimizer system in electrical communication with said user interface and said database for receiving said user requests, said input data, and said current pilot training and transition plan for generating an MIP Model which includes said recall of said furloughed pilot, and rapidly solving said MIP Model to provide said multiple alternative pilot training and transition plans.

15 2. The system of Claim 1, wherein said multiple alternative pilot training and transition plans are generated in less than one hour, and are cost optimized.

20 3. The system of Claim 1, wherein said recall of said furloughed pilots occurs in order of seniority and before any new pilots are hired.

4. The system of Claim 1, wherein said user requests include a user option to limit percentage of pilots whose start bid periods for training assignments occur outside of a bid period of said current pilot training and transition plan.

25 5. The system of Claim 1, wherein said user requests include a user option to limit total percentage of pilots whose start bid periods for training assignments occur within a bid period of said current pilot training and transition plan, and of said pilots whose start bid periods for training assignments occur outside of said bid period.

30 6. The system of Claim 1, wherein said MIP Model includes following objective function:

$$\begin{aligned}
& \text{Minimize } PNH \sum_t \sum_h NHCost_{ht} y_{NHht} + PNA \sum_t \sum_{i \in NA} NACost_{it} y_{it} + \\
& PF \sum_t \sum_{i \in F} FCost_{it} y_{it} + Ppay \left(\sum_{i \in \lambda_1} a_i R_i + \sum_{i \in 58Y} a_i R_{58i} + \sum_{i \in \lambda_2} a_i M_i \right) + \\
& PS * PBH \sum_h \sum_t S_{ht} / Blockhrs_{ht} + PE * PBH * (1/3) \sum_h \sum_t E_{ht} / Blockhrs_{ht} + \\
& PF \sum_t \sum_{i \in \lambda_{FR}} FRCost_{it} y_{FRit}
\end{aligned}$$

7. The system of Claim 6, wherein said MIP Model includes following constraint to ensure
5 that said furloughed pilots are recalled in seniority order:

$$\sum_{t=k}^N y_{FRit} - \sum_{t=k}^N y_{FRi-1t} \leq 0 \quad \forall i \in \lambda_{FR}, k \in \{1..N\}$$

- 10 8. The system of Claim 6, wherein said MIP Model includes following constraint to ensure
that new pilots are hired after all of said furloughed pilots are recalled:

$$y_{NHht} - MNH_{ht} \sum_{t=1}^k y_{FRit} \leq 0 \quad \forall h, k \in \{1..N\}$$

- 15 9. The system of Claim 6, wherein said MIP Model includes following constraints to limit
percentage of pilots whose start bid periods for training assignments may deviate from a bid period
of said current pilot training and transition plan:

$$\text{(i)} \quad \sum_t t y_{it-L(i)} - W_i - d_i + q_i = 0 \quad \forall i \in \lambda ;$$

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$$\text{(ii)} \quad d_i + q_i \leq BigM * h_i \quad \forall i \in \lambda ; \text{ and}$$

$$\text{(iii)} \quad \left(\sum_{i \in Adv_t} h_i / U_t \right) \leq P_U_t \quad \forall t \in \{1..N\} .$$

10. The system of Claim 6, wherein said MIP Model includes following constraints to limit total percentage of pilots whose start bid period for training assignments may be changed to occur within a bid period of said current pilot training and transition plan, and of said pilots whose start bid period for training assignments may be changed to occur outside of said bid period:

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$$(i) \quad diff_{it} = 1 - y_{it} \quad \forall i \in \lambda, t \in \{1..N\} \mid CM_{it} = 1;$$

$$(ii) \quad diff_{it} = y_{it} \quad \forall i \in \lambda, t \in \{1..N\} \mid CM_{it} = 0; \text{ and}$$

$$10 \quad (iii) \quad \sum_{i \in \lambda} diff_{it} / U_t \leq P_U_t \quad \forall t \in \{1..N\}.$$

11. A system for rapidly generating multiple alternative pilot training and transition plans which include a limit to changing start bid periods for training assignments for an entire airline, which comprises:

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a user interface receiving input data and user requests including a request to limit changes to said start bid periods;

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a database having stored therein said input data and a current pilot training and transition plan; and

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an optimizer system in electrical communication with said user interface and said database for receiving said user requests, said input data, and said current pilot training and transition plan, for generating an MIP Model which includes said limit, and rapidly solving said MIP Model to provide said multiple alternative pilot training and transition plans.

12. The system of Claim 11, wherein said limit applies to a percentage of pilots whose start bid periods for training assignments may deviate from a bid period of said current pilot training and transition plan.

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13. The system of Claim 11, wherein said limit applies to total percentage of pilots whose start bid period for training assignments may be changed to occur within a bid period of said current

pilot training and transition plan, and of said pilots whose start bid period for training assignments may be changed to occur outside of said bid period.

14. The system of Claim 1, wherein said MIP Model includes a following objective
5 component for tracking payroll cost of pilots recalled from furlough:

$$PF \sum_t \sum_{i \in \lambda_{FR}} FRCost_{it} y_{FRit}$$

15. The system of Claim 11, wherein said multiple alternative pilot training and transition
10 plans are cost optimized, and a following objective component for tracking payroll costs of pilots recalled from furlough is included in the MIP model:

$$PF \sum_t \sum_{i \in \lambda_{FR}} FRCost_{it} y_{FRit}$$

16. A system for generating multiple alternative pilot training and transition plans which
15 include a recall of furloughed pilots for an entire airline, which comprises:

a user interface receiving input data and user requests including a request to recall said
furloughed pilots ;

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a database having stored therein said input data; and

- an optimizer system in electrical communication with said user interface and said database
for receiving said user requests and said input data, and generating therefrom an MIP Model
25 including said recall of said furloughed pilots, and for solving said MIP Model to rapidly generate
said multiple alternative pilot training and transition plans.

17. The system of Claim 16, wherein said multiple alternative pilot training and transition
plans are cost optimized and generated in less than one hour, and said MIP Model includes a
30 following objective component for tracking payroll costs of pilots recalled from furlough:

$$PF \sum_t \sum_{i \in \lambda_{FR}} FRCost_{it} y_{FRit}$$

18. The system of Claim 16, wherein said MIP Model includes following constraints to limit percentage of pilots whose start bid periods for training assignments may differ from a specific bid period:

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$$(i) \quad \sum_t t y_{it-L(i)} - W_i - d_i + q_i = 0 \quad \forall i \in \lambda;$$

$$(ii) \quad d_i + q_i \leq BigM * h_i \quad \forall i \in \lambda; \text{ and}$$

$$10 \quad (iii) \quad \left(\sum_{i \in Adv_t} h_i / U_t \right) \leq P_U_t \quad \forall t \in \{1..N\}.$$

19. The system of Claim 16, wherein said MIP Model includes following constraints to limit total percentage of pilots whose start bid period for training assignments may be changed to occur within a specific bid period, and of said pilots whose start bid period for training assignments may be changed to occur outside of said bid period:

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$$(i) \quad diff_{it} = 1 - y_{it} \quad \forall i \in \lambda, t \in \{1..N\} \mid CM_{it} = 1;$$

$$(ii) \quad diff_{it} = y_{it} \quad \forall i \in \lambda, t \in \{1..N\} \mid CM_{it} = 0; \text{ and}$$

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$$(iii) \quad \sum_{i \in \lambda} diff_{it} / U_t \leq P_U_t \quad \forall t \in \{1..N\}.$$

20. An optimizer system including a database for rapid generation of multiple alternative pilot training and transition plans that accommodate a recall of furloughed pilots, which comprises:

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data means for receiving user requests and input data from a user;

operating means in electrical communication with said data means for generating variables and constraints from said user requests and said input data, for generating an MIP Model from said variables and said constraints which provides for said recall of said furloughed pilots in seniority order and before hiring of new pilots; and

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means for solving said MIP Model with said variables and said constraints to generate therefrom said multiple alternative pilot training and transition plans with cost factor optimization.

5 21. An optimizer system including a database for rapid generation of multiple alternative pilot training and transition plans that include a recall of furloughed pilots, which comprises:

data means for receiving user requests including a request to recall said furloughed pilots, and for receiving input data, and a current pilot training and transition plan;

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operating means in electrical communication with said data means for receiving said user requests, said input data, and said current pilot training and transition plan, for generating variables and constraints therefrom, and for generating an MIP Model from said variables and said constraints to provide said recall of said furloughed pilots in seniority order and before hiring of new pilots, and provide a limit to deviating start bid periods for training assignments with respect to a bid period of said current pilot training and transition plan; and

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means for solving said MIP Model with said variables and said constraints to generate said multiple alternative pilot training and transition plans with cost optimization.

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22. The optimizer system of Claim 21, wherein said limit is applied to a percentage of pilots whose start bid periods for training assignments occur outside of said bid period.

23. The optimizer system of Claim 21, wherein said limit is applied to a total percentage of said furloughed pilots whose start date for training assignments is changed to occur within said bid period, and of said furloughed pilots whose start date for training assignments is changed to occur outside of said bid period.

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24. The optimizer system of Claim 21, wherein said MIP Model includes a following objective function:

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$$\begin{aligned}
& \text{Minimize } PNH \sum_t \sum_h NHCost_{ht} y_{NHht} + PNA \sum_t \sum_{i \in NA} NACost_{it} y_{it} + \\
& PF \sum_t \sum_{i \in F} FCost_{it} y_{it} + Ppay \left(\sum_{i \in \lambda_1} a_i R_i + \sum_{i \in 58Y} a_i R_{58i} + \sum_{i \in \lambda_2} a_i M_i \right) + \\
& PS * PBH \sum_h \sum_t S_{ht} / Blockhrs_{ht} + PE * PBH * (1/3) \sum_h \sum_t E_{ht} / Blockhrs_{ht} + \\
& PF \sum_t \sum_{i \in \lambda_{FR}} FRCost_{it} y_{FRit}
\end{aligned}$$

25. The optimizer system of Claim 24, wherein said cost optimization includes adding a following component to said objective function:

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$$PF \sum_t \sum_{i \in \lambda_{FR}} FRCost_{it} y_{FRit}$$

26. A method for rapidly generating multiple alternative pilot training and transition plans for an entire airline, which comprises the following steps:

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receiving user requests by way of a user interface, input data from a database and said user interface, and a current pilot training and transition plan from said database, wherein said user requests include options for a recall of furloughed pilots, and for limits to deviation of pilot start bid periods for training assignments from a bid period of said current pilot training and transition plan;

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creating variables and constraints from said input data and said user requests, an MIP Model from said variables and said constraints, wherein said constraints upon exercise of said options include at least one of said recall and said limits;

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solving said MIP Model to provide a solution; and

generating from said solution said multiple alternative pilot training and transition plans.

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27. The method of Claim 26, wherein said constraints require said recall to occur in seniority order and before any hiring of new pilots occurs.

28. The method of Claim 26, wherein said limits include a limit to percentage of pilots whose start bid periods for training assignments occur outside of said bid period.

29. The method of Claim 26, wherein said limits include a limit to total percentage of said furloughed pilots whose start date for training assignments is changed to occur within said bid period, and of said furloughed pilots whose start date for training assignments is changed to occurs outside of said bid period.

30. The method of Claim 26, including the step of including cost factors in said MIP Model to optimize said multiple alternative pilot training and transition plans, and track payroll costs of pilots who are recalled from furlough.

31. A method for generating multiple alternative pilot training and transition plans for an entire airline which accommodate a recall of furloughed pilots, which comprises the following steps:

receiving user requests from a user by way of a user interface, and input data from a database and said user interface, wherein said user requests include options for limits to extent of deviation of pilot start bid periods for training assignments from a specific bid period;

creating variables and constraints from said input data and said user requests, and an MIP Model from said variables and constraints, wherein said constraints require said recall to occur in seniority order before any new hires occur, and upon exercise of said options require said limits;

solving said MIP Model to provide a solution; and

generating from said solution said multiple alternative pilot training and transition plans.